BULLETIN

THE AMERICAN INTERPLANETARY SOCIETY

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David Lasser, President Clyde J. Fitch, Editor.

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Goddard Describes New Stratosphere Plane

Amplifying previous stories of his invention of a new stratosphere plane, which is a combination propeller and rocket craft, Dr. Robert H. Goddard, noted rocket experimenter, described the details of his invention in the New York Times, of September 27.

The present propeller plane, said Dr. Goddard, which is practically unchanged in principle since the days of the Wright brothers, is purely a low altitude vehicle, and encountering the enormous air resistance at those altitudes, its speed is definitely limited.

The rocket plane, however, is inefficient at low altitudes and the consequently necessary low speeds. In fact, he says, quoting Maurice Roy, who wrote in La Technique Aeronautique, rocket propulsion will be more efficient than propeller propulsion only at speeds of 600 miles an hour and more.

For a versatile plane, that shall be able to take off from the ground and land at reasonable speeds, and shall also be able to ascend to the upper reaches of the atmosphere and take advantage of the rarefied air, Dr. Goddard has devised a propeller-rocket system.

The plane, which is equipped with rocket exhausts that shall stream from the tail, has also on both sides of the exhaust, turbine propellers. When the plane is leaving the ground or returning to it, the rocket exhausts are directed onto the propellers and turn them, sending the plane ahead by the propeller action.

When a speed of 200 to 300 miles an hour has been reached, the propellers would be moved out of the way of the rocket exhausts and the plane would continue to acquire speed and ascend higher and higher as a pure rocket, "until," says Dr. Goddard, "1,000 miles an hour were reached at 30,000 feet, and much greater speeds at a height of, say, 100 miles. At this great altitude, the air resistance

would be negligible, even at these high speeds.

The rocket, states Dr. Goddard, is not only most efficient in a vacuum (22 per cent more efficient than at sea level) but it is more efficient at high speeds than other methods of aerodynamic propulsion. A rocket, he says, "fed by a mixture of liquid oxygen and gasoline is 60 per cent efficient at speeds in excess of 600 miles an hour, as compared to a fuel power efficiency of 22 per cent for a steam engine, and 33 per cent for an ordinary Diesel engine." The maximum efficiency of a rocket, where the exhaust gases are expelled at 4,000 feet a second would be reached when the rocket is travelling at 3,000 miles an hour.

Such speeds, Dr. Goddard goes on to say, will not be noticed in the upper rarefied atmosphere, and there free from storms, fog and other hindrances, the rocket plane would become a most efficient means of transportation.

Dr. Goddard's statements are not based alone on sound theory, but also on experiments which have proved them to be practical in themselves. His rocket tests, carried out at Camp Devens, Mass. in 1930 and now at Roswell, New Mexico where he is working under a grant from the late Daniel Guggenheim, have shown that he has obtained 200 horse power per pound of combustion chamber.

The ultimate distance to which rocket propelled vehicles may ascend is largely a matter of the size of the plane and the weight of the fuel, "The question," says Dr. Goddard, "can, perhaps, be best answered by calling attention to my paper in the Smithsonian Institution Miscellaneous Collections for 1919, in which it was concluded that a series of relay rockets (known as the step rocket-Editor) of successively smaller size, each fired as the one below became empty of fuel, could reach an indefinitely high altitude. The present rocket turbine, used in place of the first relay rocket, would mean that the atmosphere, instead of being a resisting medium and a hindrance, would be useful as a means of furnishing reaction in the first stage of such a journey."

In order to make his plane as flexible and versatile as possible, Dr. Goddard has arranged it so that the rocket turbine may be operated partly by the turbine blades and partly by the rocket blast, so that partial rocket action can be used where the air is not too thin to be reacted against by the propellers; and rocket action can alone be used where the air is too thin to permit of an propeller action.

The objection to rocket action alone at low speeds is that the exhaust gases travelling at very high speeds carry away with them most of their energy, and little is given up to the rocket. But as the speed of the rocket approaches that of the gases exhausted, the percentage of the kinetic energy of the gases that is given up to the rocket itself becomes greater and greater.

It is impossible to say, states Dr. Goddard, when a plane equipped with the rocket turbine will be ready for a flight. The fund provided by the late Daniel Guggenheim, was given really for the development of high altitude meteorological rockets, for the study of the upper atmosphere, rather than for the development of a new means of transportation.

Two October Lectures Scheduled For Society

Two lectures of the American Interplanetary Society have been scheduled for the month of October, to be given at the American Museum of Natural History

in New York.

The first will be held on the 9th of October when Mr. Laurence Manning will discuss the vitally important question of what aids can be given to a rocket in getting it off the earth, on a journey into interplanetary space.

David Lasser, president of the Society, will speak on the 23rd of October on "The Rocket In Warfare", an exposition, of the fearful as well as the destructive possibilities of the rocket.

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Rocket Articles Feature Recent Publications

Evidence of the continued and increasing interest in the rocket and its potentialities is found in the featuring of rocket articles in recent magazines and newspapers.

"Rockets - The New Monsters of Doom" is the title of an article by Rutherford MacMechen in Liberty for September 19. Mr. MacMechen sees rockets travelling at 10 miles a second, delivering mail from New York to San Francisco in five minutes, and in fact making it simpler to send mail by rocket than to telegraph.

Mr. MacMechen credits some experimenter with having sent a "mammoth rocket out of sight into the sky" near Berlin a few months age, going to a height greater than ever reached by man, and that Dr. Goddard" is accredited to his European rivals with having sent one of the weird things sixty miles from the earth."

The rocket will not only be possible for an interplanetary exploration, says the writer, but used in warfare they will bring wholesale death. "They will be capable of traveling completely around the world and dropping at any designated point ..... A few hundred of them dropped in certain places would reduce civilization to ruins in less than a week."

"If the Earth Becomes Uninhabitable-Where Shall We Go?" is the subject of a series of articles by Professor Reno Thevenin, a French scientists which appeared in The American Weekly for the weeks of September 6, 13 and 20th. Professor Thevenin sees many possibilities that may some day force the human race to leave the earth and seek a haven on some other world.

The rocket, is doomed by him, as the means of salvation, to explore other worlds, discover which are habitable, and to finally transport the race to its new home. His articles also discuss the question of how we might send signals to other worlds to discover, in the first instance, whether intelligent life really exists upon their surfaces.

"Berlin To New York In One Hour" by Hugo Gernsback appears in the November issue of Everyday Science and Mechanics magazine Mr. Gernsback, who is editor of the magazine shows how this facinating possibility of the rocket may transform our civilization, by making a transatlantic journey of the same duration as a suburban ride in our own time.

"By Rocket To The Planets" by David Lasser will appear in the November issue of Nature Magazine. Mr. Lasser who is president of the American Interplanetary Society shows how the interplanetary journey may be accomplished and what men may find upon other worlds.

Preliminary Rocket Experiments Outlined

Editor's Note: The following is an outline for the performing of a series of simple, but fundamental rocket experiments. Formulated by the Research Committee of the American Interplanetary Society, they provide a mean of studying the operating qualities of rocket motors, in order to determine what power they might develop under various conditions. They have been accepted by the Society as the basis for its own experimentation, and is published here in the hope that individuals and research organizations of all kinds, interested in making contributions to rocket experimentation may find a basis for their own work. Individuals or organizations interested in experimentation on rockets or desiring further information from the Society are invited to write to its headquarters, 113 W 42nd St., New York.)

OUTLINE OF EXPERIMENT NO. 1 ON RECOIL MOTORS BY THE AMERICAN INTERPLANETARY SOCIETY

Purpose To determine the power, efficiency and general value of various types of rocket combustion chambers, using liquid oxygen and gasoline (or fuel oil) for fuel.

Place of Experiment An isolated spot, sufficient removed from buildings or inflammable material in case of an explosion. The grounds should be large enough to provide space to surround the equipment with an embankment, preferably of sandbags, behind which observers can watch the progress of the combustion. The best location is in a depression of the groundm surrounded by sandbags, with observers protected, at a high level. Proper arrangements for the distant control of fuel flow, etc. must be provided before the experiment begins.

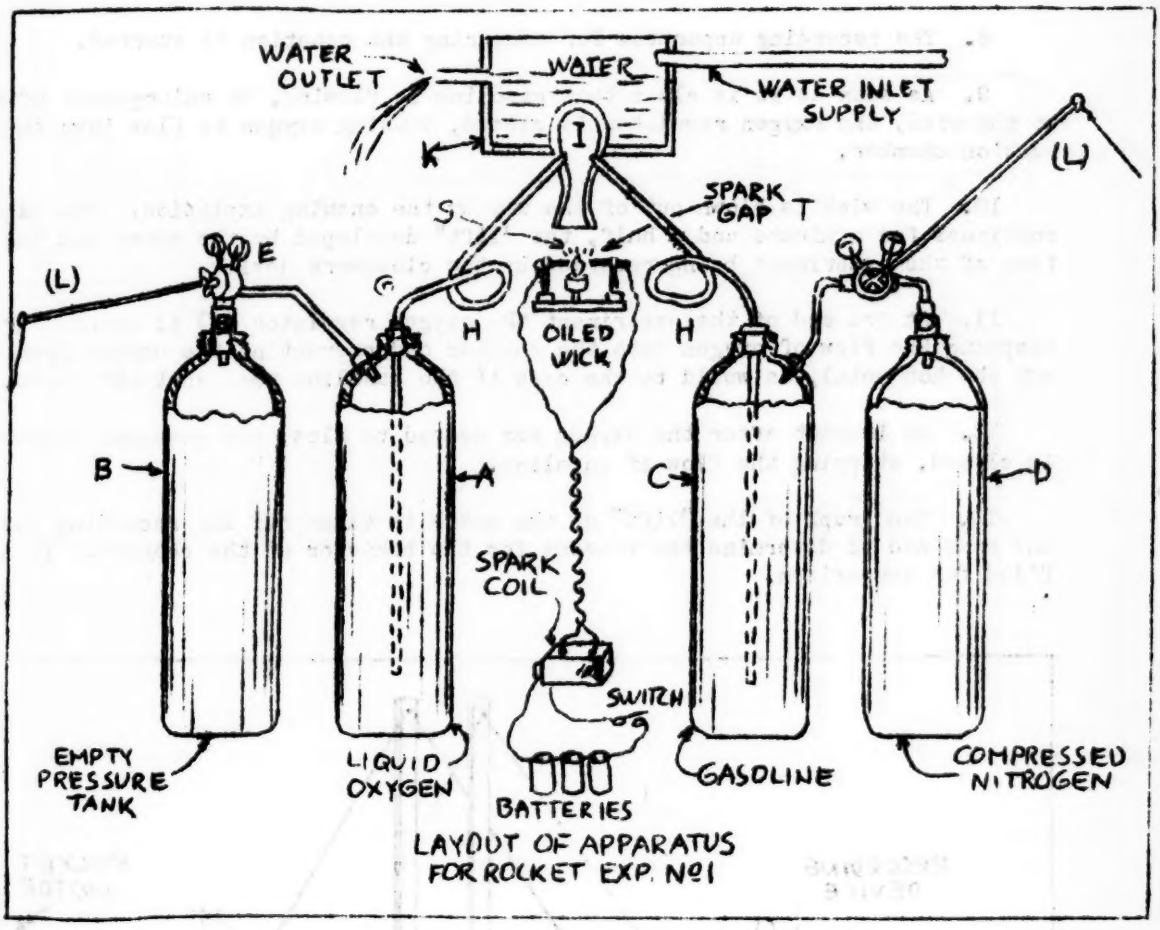
Personnel The primary essential is an expe.t on the handling of liquid oxygen and other liquified gases. Competent mechanics and trained engineers are necessary to the set-up and control of the apparatus.

Apparatus As follows: (See Illustration" Layout of apparatus")

1. Tank for oxygen fuel (A)
2. Oxygen pressure tank (B)
3. Tank for gas guel (C)
4. Nitrogen pressure tank (D)
5. Regulator for oxygen fuel (E)
6. Regulator for gas fuel (F)
7. Plug for oxygen tank (G)
8. Flexible feed pipe (H)
9. Combustion chamber to be tested (I)

2--- experiment on recoil motors

10. Cooling water container (K)
11. Lever for remote control of valves (L)
12. Scale beam (M) (See "Testing Set Up" illustration)
13. Spring calibrated to recording device (N)
14. Recording device, operated by clockwork (O)
15. Support structure (P)
16. Metal shields (R)
17. Wick for igniting rocket motor (S)
18. High tension spark apparatus (T)



LAYOUT OF APPARATUS FOR ROCKET EXP. No1

Procedure As follows:

1. Pour oxygen into oxygen tank and open valve to pressure tank. All oxygen valves are open at this stage to permit free escape of gas.

2. Close regulator valve to oxygen pressure tank. This causes flow of oxygen under oxygen gas pressure into combustion chamber, cooling it and freezing water in cooling chamber.

3. Oxygen regulator opened to close flow of oxygen to combustion chamber.

4. A wick dipped in gasoline is previously set between points of the high tension spark gap, about two inches below end of combustion chamber nozzle.

5. All men are ordered to safety behind bank or in dugout.

6. When all have reached safety, the high tension spark circuit is closed, causing spark to ignite wick.

7. The gasoline regulator (F) is opened, permitting nitrogen gas pressure to force gasoline into the combustion chamber.

8. The recording apparatus for measuring the reaction is started.

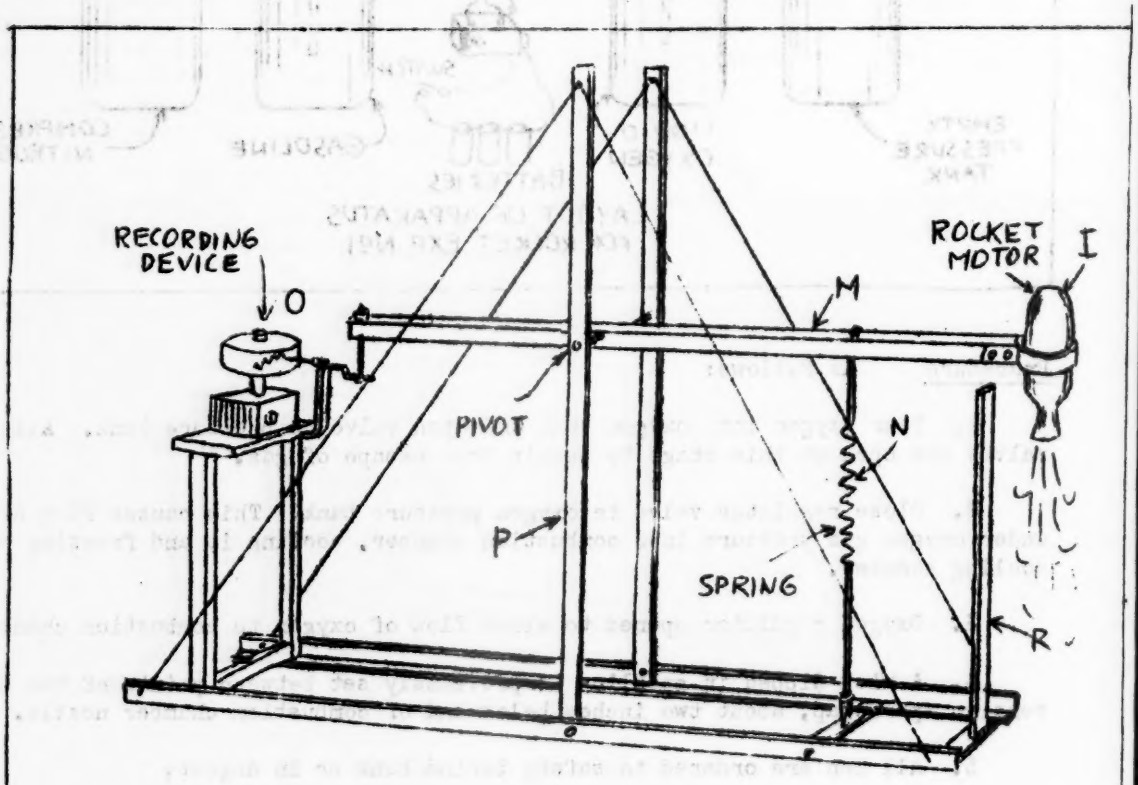
9. As soon as it is clear that gasoline is flowing, by enlargement of flame at the wick, the oxygen regulator is closed, causing oxygen to flow into the combustion chamber.

10. The wick is blown out of the way by the ensuing explosion. The experiment continues for a minute and a half, the "lift" developed by the motor and the exact time of the experiment being recorded by the clockwork device.

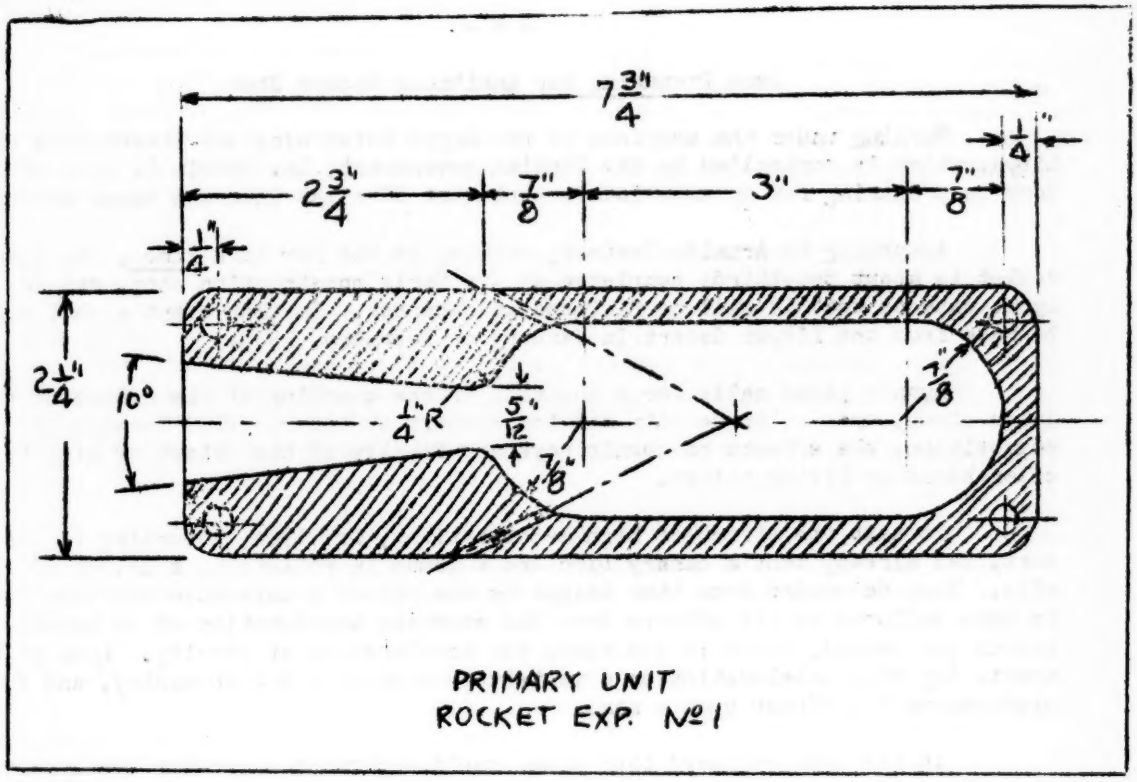
11. At the end of the experiment the oxygen regulator (E) is opened first, stopping the flow of oxygen into the chamber and preventing the oxygen from cutting out the hot metal, as would be the case if the gasoline were shut off first.

12. An instant after the oxygen has ceased to flow, the gasoline regulator (F) is closed, stopping the flow of gasoline.

13. The graph of the "lift" of the motor is taken off the recording device and examined to determine the reasons for the behavior of the chamber. It is later filed for comparison.



TESTING SET UP OF ROCKET EXP. N°1



PRIMARY UNIT
ROCKET EXP. Nº 1

14. The motor is changed to alter its shape, size, nozzle or other characteristic and the experiment repeated, to determine what effect each variation has upon performance.

Telescopic Wings On New Plane

A new development in airplane design, which may be of interest to rocket plane experimenters, has been invented by Ivan Makhonine, a Russian engineer living in Paris. Makhonine predicts that his invention will make certain faster air speeds than now are possible and will bring New York within twelve hours of Paris.

The principle of the Makhonine invention is to reduce the air resistance offered by the heavy wings of the ordinary plane. This is done by means of an adjustable extension which slides into and out of the main wing on the central bar.

This enables the large wing area, which is necessary for lifting a fully-charged plane, to be reduced progressively as fuel is used up weight diminished, and speed increased.

In the first test carried out, Makhonine's airplane was fitted with an ordinary 450 h.p. Lorraine motor. An ordinary plane so equipped has a speed of about 110 miles per hour. Makhonine's plane is said to have achieved more than 200 miles per hour.

Lyon Preparing For Ambitious Rocket Shot

Working under the auspices of the Royal Meteorological Observatory of Libya, which is controlled by the Italian government, Dr. Darwin O. Lyon of New York is preparing for an ambitious rocket shot 50 miles into the upper atmosphere.

According to Arnaldo Cortesi, writing in the New York Times, Dr. Lyon's rocket is about two-thirds completed at its Paris construction shop, and Dr. Lyons expects that it will be finished in December. In that event a shot will be made from the Libyan desert in January or February, 1932.

Lyon's plans calls for a solution of the question of the nature of the upper atmosphere -- its density and temperature at the rarefied levels, its composition, the effects of cosmic rays and finally of the effect of high accelerations on living things.

To test the effect of high accelerations, Dr. Lyon, according to the report, has already sent a canary bird and a mouse in rockets to a height of one mile. They descended from that height by the aid of a parachute and were found to have suffered no ill effects from the starting acceleration of 55 meters per second per second, which is six times the acceleration of gravity. Lyon plans now to try this acceleration on a vertebrate such as a dog or monkey, and so approximate the effect upon a man.

It has been believed that a man could not stand a greater acceleration than three times that of gravity, for even such an acceleration would cause a pressure upon him of three times his own weight.

The solution of the question of the effect of cosmic rays is among the principal objects of Dr. Lyon, according to the report. These cosmic or Millikan rays, in honor of their discoverer, are extremely penetrating, and it is believed by some authorities that in the upper atmosphere, where there is little protection against their full force, living matter would be quickly destroyed.

The question has been debated by many authorities, and it is conceded that only experimentation can definitely solve it. The recent balloon ascent of Professor Piccard to a height of ten miles, where the atmospheric density is only about 1/20 of what it is at sea level was also designed to test the effect of cosmic rays. Professor Piccard, according to preliminary studies of the results of his flight, found no dangerous effects.

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French High-Altitude Plane Ready Soon

A plane to fly safely at an altitude of 15,000 feet and develop speeds of 300 to 470 miles an hour, under construction for the French government by the Farman Company of Paris, may be ready for a test soon.

The French government, according to reports, has appropriated about a million dollars to the development of this plane.

Equipped with a seventeen-foot, adjustable, all metal, four-bladed propeller, the machine is designed to achieve high speeds with safety, in rarefied air. The motor is equipped with two superchargers, one charging the other in order to obtain enough oxygen for the burning of the fuel at that level; and the cabin will be completely enclosed, and a sea level atmospheric pressure maintained within the cabin during flights.

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Interplanetary Exploration By Telescope Predicted

The exploration of our neighboring planets by a super-telescope is envisioned by O. H. Caldwell, editor of Electonics magazine. Mr. Caldwell, who is an authority on radio and television sees that the photo electric Cell can come to the aid of astronomy in overcoming the limitations of our present telescopes.

The telescopes we use today, he says, are merely enlargements of the same instruments used by Newton and Galilee three hundred years ago. And because of the extreme difficulty in making larger lenses and mirrors, in order to extend the range of our vision into the heavens, new principles must be employed.

Mr. Caldwell would use the photoelectric cell to "explore" a nearby planet such as Mars, point to point. The impulses received would be amplified as much as 1,000,000,000 times and each impulse registered on photographic plates. By a great number of these extremely detailed pictures it would be possible to construct an enormous photograph of a planet or of the moon.

Thus many of the planetary mysteries, such as the Martian canals, the details of the moon, the nature of the surface of Venus, may be brought closer to a solution.

The extreme difficulty in the construction of the 200 inch telescope for the Mt. Wilson Observatory is making it evident that we are reaching the limit of telescopic power by classical methods. In the pronouncements of Mr. Caldwell may be found the germ of telescopes of the future, whose range and power will be many times greater than these now possible.

Presence of Lunar Life Debated

The pronouncement of most astronomers that life cannot exist on the moon is open to debate, writes Percy H. Wilkins in English Mechanics.

Although the believed airlessness and aridity of the moon seems to preclude any life forms, Mr. Wilkins mentions the extensive researches of Professor W. H. Pickering of the Harvard Observatory as tending to deny that.

Professor Pickering, says Mr. Wilkins, during the past twenty-five years has investigated the opinion that the moon is but a "derelict world, airless, waterless, lifeless, a barren waste of extinct volcanoes. "Professor Pickering's study of the crater Erastes thenes has shown changes in the crater of a more or less periodic nature.

These changes are admitted by many astronomers-and some are even willing to concede that there may be some low forms of vegetation existing in the crater. But Professor Pickering in his pamphlet, Erastesthenes, No. 6, Migration of the Plate, advancing his belief of the existence of animal life on the moon says, "there is no reason to suppose that the lunar insects resemble any terrestrial animals. Since their environment is so different, we may say further, that it is extremely improbable that they do resemble any terrestrial form of life, but since it is not worth while to coin a new name for them, and since they must be of the same order of size as our insects, we will simply call them by that name, whether they have two legs, four, six or fifty."

Other craters, says Mr. Wilkins, have also shown slight changes, such as those observed in the crater Linne by Schmidt, and the crater Plate Messier and others. But, comments Mr. Wilkins, although these discoveries, "have aroused interest, they failed to shake the extensively entertained negative opinion," regarding the presence of life on our satellite.

The construction of a new large map of the moon, made possible by the excellent photographs obtained by the Yerkes and Mt. Wilson observatories, may make possible a clearer determination of these questions. The largest map is now on a scale of 200 inches to 2000 miles; and an even larger one could be constructed when available data on the moon is gathered together. Erastesthenes which is 37 miles in diameter, would be shown on the present maps as about 3.7 inches long.

The belief that the moon contains no life of any kind is based upon the deduction that there is little or no atmosphere on the moon. The absence of atmosphere is because the moon's gravitational field is not powerful enough to hold one. This is further backed up by astronomical observation of starlight which passes close to the moon, showing that the light is not refracted, as it would be if an atmosphere was present. Without an atmosphere the moon's surface would be very dry as all moisture would immediately evaporate at the temperatures and pressure encountered; and with no air or water, it is doubtful if living organisms of any kind could long exist. Thus two schools of thought on the interesting question of lunar light wage a steady warfare.

Meetings of the New York members of the American Interplanetary Society are held on the first and third Fridays of each month at the American Museum of Natural History, 77th Street and Central Park West. Associate membership in the Society at $3.00 per year may be obtained by sending the first year's dues to the Secretary, Nathan Schachner, 113 W. 42nd Street, New York. Information on the other classes of membership, active and special may be obtained by writing the Secretary.